

## BOOK REVIEWS

MACKENZIE W.S., GUILFORD C.: **Atlas of rock-forming minerals in thin section.** Longman, Burnt Mill, Harlow, Essex, 1980. 2<sup>nd</sup> impression 1981, VI+98 pp, 227 colour photos.

It is an excellent laboratory textbook for mineralogists and petrographers studying rock-forming minerals in thin section. Over 200 colour photomicrographs present 87 minerals in plane-polarized light and under crossed polars. In the case of pleochroic minerals, two photographs taken in plane-polarized light are presented, with the polarizer in two orthogonal positions. A short description accompanying each plate refers essentially to these features of mineral that are readily visible on the photographs. The authors took great care to choose mineral specimens showing typical features suitable for their identification. The book has been conceived as supplementary to *An introduction to the rock-forming minerals* by W. A. Deer, R. A. Howie and J. Zussman, so the minerals are arranged in the same order as in the cited book. At the end of each description, the numbers in brackets refer to the corresponding pages of that textbook, where the reader can find more details concerning the given mineral.

It is the first very successful atlas of colour photomicrographs of rock-forming minerals in thin section, distinguished by the excellent technique of colour photographs and their reproductions.

Witold Żabiński

BRINDLEY G. W., BROWN G.: **Crystal structures of clay minerals and their X-ray identification.** Mineralogical Society, 41 Queen's Gate, London SW7 5HR, 1980, 495 pages.

Since the appearance of the *X-ray identification and crystal structures of clay minerals* edited by G. W. Brindley and issued by the British Mineralogical Society in 1951, and since the publication of the second edition of this monograph edited by G. Brown in 1961, the scope of structural investigation of clay minerals had been considerably extended. This induced the editors of the third edition (G.W. Brindley, G. Brown) to change the arrangement of the book and its title. Due to the new approach, the book serves better than the previous editions its double purpose:



that of an encyclopedic compilation of fundamental data on the structure of clay minerals, and that of a laboratory textbook of X-ray identification of these minerals.

The separate chapters were written by well known specialists in modern structural mineralogy.

The comprehensive first chapter (S. W. Bailey) is devoted to the classical structures of layer-lattice and chain-layer silicates, giving very precise data on the position of atoms. It does not deal with smectites nor minerals with irregular or disordered structures (vide Chapters II, III, IV). A discussion of groups containing di and trioctahedral minerals is preceded by the general structural data characteristic of each group, and the basis for further classification is presented. The names of groups, subgroups and minerals used in this chapter are only those approved by the Nomenclature Committee of the AIPEA and the Commission on New Minerals and Mineral Names. The descriptions of minerals are supplemented by revised or recent powder data and by diagrams of structures. The descriptions of minerals are brief but include all the basic, fully reliable and verified, data. Chapter I has a great scientific value, its contents being essential for the identification of minerals and their polytypic varieties.

Chapter II (G. W. Brindley) presents the problem of order-disorder in the structures of clay minerals. It discusses briefly the types of disorder peculiar to these minerals and the theory of X-ray diffraction on microcrystal lattices, two-dimensional lattices included, taking into particular consideration translation stacking faults. The importance of this chapter can hardly be overrated as disorder is a feature inherent in the structures of clay minerals. The introduction of the quantitative evaluation of structural faults in dioctahedral 1:1 minerals promises the full quantitative utilization of the  $hkl$  reflections, especially the 02.11 and 20.13 bands.

Chapter III (Douglas M. C. MacEwan and M. J. Wilson) is concerned with interlayer complexes and the intercalation of clay minerals. It is based on the classical works on this subject, mostly from 1950—1970, and deals with water complexes, rehydration and dehydration, organic complexes and their use for the identification of 2:1 minerals and dioctahedral complexes of 1:1 minerals. The chapter includes a large number of well known diagrams and numerical data which are of great assistance in the studies of clay minerals.

Chapter IV (R. C. Reynolds) deals with mixed-layer minerals. It presents the identified mixed-layer minerals along with a statistical model of the description of their structures and factors determining the shape of diffraction lines. It also gives a historical approach to the interpretation of X-ray diffraction patterns and some examples of calculated diffractograms in the form of diffraction curves and tables of interstratification of structurally different layers. The shortcomings of this chapter are the lack of a structural classification based on probability coefficients, and the lack of a consistent theory of X-ray diffraction taking into account all factors and permitting the reproduction of X-ray diffraction patterns of any mixed-layer structure<sup>1</sup>.

<sup>1</sup> The book by V. A. Drits and B. A. Sakharov, *X-Ray Structural Analysis of Mixed-Layer Minerals* (in Russian) is only mentioned in the References to Chapter IV. A review of this book was published in *Clays and Clay Minerals*, Vol. 26, 1978, p. 244.

Chapter V (G. Brown and G. W. Brindley) describes the procedures of X-ray diffractometry and the identification of clay minerals. A discussion of the method of preparation of samples to be investigated and of the basic conditions and principles of X-ray technique is followed by the presentation of the principles of systematic analysis for the identification of groups, subgroups, minerals and their polytypes. The table included in this chapter gives basal  $d$  values in Å for clay minerals and the coinciding  $d$  values for other minerals.

Chapter VI (G. Brown) deals with accessory minerals, providing short descriptions and tables of  $d_{hkl}$  values and X-ray reflection intensities for oxides, hydroxides, phosphates, sulphates, carbonates and silicates. The approach to the subject is modern, and the chapter can be of considerable assistance in the identification of accessory minerals.

Chapter VII (G. W. Brindley), being the last chapter of the book, presents the elementary relationships for X-ray quantitative phase analysis. It discusses the standard methods, the effect of various factors, and the potentialities of the method with regard to the particular groups of clay minerals.

The book is supplemented (G. Brown) with a table of  $d$  values in Å read from diffraction angles ( $2\theta$ ) for the characteristic  $K_{\alpha}$  and  $K_{\beta}$  Cu, Co, Fe radiation. It also contains three indexes: of authors, minerals and subjects, which considerably help the reader to use this monograph.

A careful revision of the contents of all chapters shows the authors' endeavours to present fully reliable and verified data. It seems that it was this consideration that made the editors omit „new” theories of formalisms that had not yet been generally accepted, for example, the OD (order-disorder) theory. It is to be regretted that no mention is made of the achievements of a group of Russian researchers, who developed a consistent theory of X-ray diffraction analysis of mixed-layer structures, based on the same mathematical formalism as used by professor Tchoubar's group in the investigation of stacking faults in layer-lattice silicates. It is conceivable that the reason for this omission was the language barrier.

It is scarcely necessary to discuss the usefulness and the scientific value of this book, as it is beyond doubt that a few subsequent generations of specialists in clay minerals will be educated on it, and that it will serve, as the two previous editions did, many mineralogists, production engineers, chemists and other research workers for the next few decades.

Andrzej Wiewióra

W. RYKA, A. MALISZEWSKA: *Słownik petrograficzny (Dictionary of Petrography)*, in Polish. Wydawnictwa Geologiczne, Warszawa 1982; 404 pages, figures, 34 colour photographs.

Polish geological literature was recently enriched by a new publication, the *Dictionary of Petrography* by Waclaw Ryka and Anna Maliszewska (research workers at the State Institute of Geology in Warsaw), issued by the Geological Publishers in Warsaw in 4000 copies.

The first *Dictionary of Petrography* in Polish was compiled by Z. Pentlakowa and contained 1850 entries. It was published in 1962 and was soon



out of print, so the need arose for a new, updated dictionary. Compared with the first dictionary, the new one is more comprehensive as it includes 5300 entries embracing the body of knowledge about rocks. Individual entries give information on the mineralogical composition, structure, physical and chemical properties, forms and the occurrence of rocks, on the classification schemes, methods of investigation, as well as on petrographic laws, theories and hypotheses. The dictionary also presents data from the fields of mineralogy, geochemistry, dynamic geology, ore petrography and geophysics, whenever such data bear relation to petrography. The general entries and those dealing with the petrography of igneous rocks were compiled by W. Ryka, the ones concerned with the petrography of sedimentary rocks by A. Maliszewska, while the entries concerning the petrography of coal were prepared by K. Kruszewska. The entries are arranged in alphabetical order and are divided into general, particular, complementary and reference entries. The general entries are comprehensive discussions or general introductions to particular entries, the latter being quantitatively dominant. The complementary entries are short, dealing with uncommonly used, incorrect, uncertain, etc. terms. Reference marks have been placed at those entries which are explained at greater length in other entries. To make the texts more comprehensible, a large number of entries have been complemented by photographs, figures and diagrams.

The systematic position of rocks discussed in the dictionary has been based on the up-to-date classification systems; for example, igneous rocks are described using the classification scheme and nomenclature recommended by the Classification Subcommittee for Igneous Rocks of the International Union of Geological Sciences (I.U.G.S.). The dictionary contains a list of abbreviations used in the text and in figure captions. The references given at the end of the book also include publications in which the reader can find additional information on the subjects discussed in individual entries (444 references).

The recently published dictionary takes into account the latest trends in petrography, is more comprehensive and shows a more modern approach to the subject than the dictionaries of petrography of A. Holmes (1920), Z. Pentlakowa (1962) or F. Leowinson-Lessing (1963), available in Poland.

It can be stated with confidence that this publication fills the gap in the Polish geological literature and will be an excellent reference book for both the students of geological sciences and research workers specializing in petrography or related sciences.

Włodzimierz Parachoniak

SCHMIDT WOLFGANG, MALZAHN HEINZ: **Industriemineral Diamant**. VEB Deutscher Verlag für Grundstoffindustrie, Leipzig 1980, 301 pages, 159 figures, 51 tables, 224 references, subject index.

This publication is a successive book in the library edition *Nutzbare Gesteine und Industriemineralien*, following the *Natursteine*, *Quartzrohstoffe* and *Fluorit*. Intended primarily for the workers of tool industry, it is equally interesting for mineralogists. The book is essentially a monograph

but owing to the way of presentation of problems, it may also be used as a textbook.

The book of W. Schmidt and H. Malzahn is a comprehensive discussion of diamond from the viewpoint of applied mineralogy. Its contents is well illustrated by the titles of chapters: 1. Properties of Diamond, 2. Diamond Deposits, 3. Exploitation and Processing of Deposits, 4. Synthesis of Diamond, 5. Organization of World Trade in Diamonds, 6. Sorting and Evaluation of Natural and Synthetic Diamonds, 7. Working of Diamond, 8. Industrial Uses of Diamond, 9. Gem Diamond, 10. Diamond Substitutes, 11. Price and Exploitation Policy for Industrial Diamonds.

As is evident from the table of contents, the book discusses the whole spectrum of problems connected with diamond from the mineralogical, crystallographic, chemical and technological characteristics, through a detailed description of the conditions of occurrence and genesis of all the major diamond deposits (including their profiles), to the exploitation and enrichment techniques. Then a brief outline of the history of diamond synthesis and a technological description of this process are followed by a concise discussion of the monopolistic organization of world trade in diamonds. From Chapter 6, the book deals with the practical uses of natural and synthetic diamonds in tools and as a jeweller's material. A concise and comprehensible description gives the principles of evaluation of natural diamonds as well as the characteristics of synthetic diamond varieties illustrated by photographs of crystals. Then the mechanical workability of diamond, depending on the crystallographic orientation, has been determined. The industrial applications of diamond have been clearly distinguished and comprehensively discussed. They include tools based on a monocrystalline element (balance supports, hardness tester cones and pyramids, grinding wheel dressers and drill bits), granular tools (face, disk-type and segmental grinding wheels, abrasive cloth and paper), and polycrystalline diamond composites. The technological part ends with two short chapters discussing the history and the present of gem diamonds and giving principles of their working, as well as the characteristics of crystals imitating natural diamonds or substituting diamond in technological applications: rutile, fabulite, zircon, YAG yttrium-aluminium garnet, sapphire, spinel, BN — regular boron nitride. The book ends with a brief assessment of the effect of this mineral on the deposit exploitation and market policy in the world.

The book is amply and carefully illustrated. Also the tables characterize excellently the subject matter. The bibliography includes all the publications essential to the problems discussed, and subject index is carefully compiled. The handling of the subject matter is very objective and interesting. The only qualification concerns the list of references which is not given in alphabetical order. In a book edition such arrangement makes the references difficult to use.

The book is worth recommending to all mineralogists, both those engaged in scientific research and those specializing in technological uses of minerals.

Andrzej Szymański